

Special Issue

Mathematical Fluid Dynamics: Theory, Analysis and Emerging Trends

Message from the Guest Editor

This Special Issue explores the mathematical essence of fluid motion through rigorous analysis, geometric reasoning, and modern data-driven methodologies. It seeks to illuminate how the foundational equations of continuum mechanics—most notably the Navier–Stokes and Euler equations—continue to pose profound challenges concerning existence, regularity, and singularity formation, while also inspiring new analytical and computational paradigms. The Issue highlights advances in the mathematical theory of turbulence, the energy cascade across scales, and the analysis of free-boundary, multiphase, and magnetohydrodynamic (MHD) systems. Emphasis is placed on frameworks that integrate functional and harmonic analysis, stochastic formulations, and variational or geometric principles, thereby extending the reach of classical fluid theory. Moreover, the Issue welcomes mathematically grounded approaches to physics-informed and machine-learning-assisted modeling, which reconcile data adaptability with physical and analytical integrity.

Guest Editor

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About the Journal

Message from the Editor-in-Chief

The journal *Mathematics* publishes high-quality, refereed papers that treat both pure and applied mathematics. The journal highlights articles devoted to the mathematical treatment of questions arising in physics, chemistry, biology, statistics, finance, computer science, engineering and sociology, particularly those that stress analytical/algebraic aspects and novel problems and their solutions. One of the missions of the journal is to serve mathematicians and scientists through the prompt publication of significant advances in any branch of science and technology, and to provide a forum for the discussion of new scientific developments.

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